

Shrimp Research by the U. S. Fish and Wildlife Service

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THE BIOLOGICAL STUDIES of our shrimp laboratory encompass several types of work. Under general work, the compiling of a world-wide bibliography on the Penaeidae of over 700 titles will be submitted for publication within the next few months. Laboratory studies include determining the effect of different substrates on the rate of growth. Post-larval grooved shrimp reared on bottom covered with the stiff marsh grass, *Spartina alterniflora*, increased in length 122 per cent in 61 days, against 39 per cent when placed on bottoms covered with mud and 50 per cent on sand. These experiments are being repeated commencing with large shrimp, and already the *Spartina* covered bottom is proving superior. These experiments point out the desirability of maintaining vegetated marsh as nursery areas.

Preliminary work on reaction of shrimp to light gradients in a 12-foot tank show random movements by the white shrimp (*P. setiferus*) while the grooved shrimp (*P. aztecus*) preferred the extreme dark end of the tank.

Post-larval shrimp proved very tolerant of temperatures from 4° to 40°C. Post larvae only 12 mm long survived indefinitely at 40°C. Respiration experiments have been started to decide at what point oxygen deficiency becomes a limiting factor.

The work by Charles Dawson on the use of vital stains for marking shrimp has been published. He found red, green and blue stains that give good results. We have tested the red stain which can be fed to larval shrimp as small as 12 mm in a food mixture. After two months, 90 per cent of the marks were easily recognizable. All three stains can be used in shrimp from 30 mm and larger by injecting .01 to .02 cc. of a one per cent solution in artificial sea water isotonic to the water in which the shrimp are held. Twenty one hundred shrimp were marked and released and a few recoveries were made. Of the controls held the survival was: out of 50 green-dyed—31 in 3 months; out of 10 blue-dyed—5 in 3 months; out of 50 red-dyed—34 in 3 months. All controls, except three of those fed the red dye, were clearly marked after three months. We are experimenting with another blue stain which appears to yield better survival than the one now in use.

Field studies are being carried out on shrimp while in the marshes and estuaries. One of the first problems was to discover how to obtain quantitative samples in the stiff marsh grass of the shallow waters. This was finally solved by development of a special push-type net on runners that efficiently samples young shrimp from 12 to 85 mm in length.

After preliminary reconnaissance we have selected Clear Lake as an ideal spot to determine the seasonal abundance of white and brown shrimp in an estuarine environment. By sampling at the inlet to the lake we can obtain accurate data on the inshore and offshore movements, and the changes in size within the lake will give needed information on growth. Incidentally, we often find large shrimp in these nursery areas and this raises the question of what factors induce them to leave the inside areas. For this reason we are collecting physical and chemical data to discover any clues.

Little quantitative data are available on the effect of predation in nursery areas, but we are studying the feeding habits of the sand trout, *Cynoscion arenarius*; and other estuarine fish, since shrimp are found in most of the fish stomachs examined.

The fishery for shrimp to sell as live or dead bait has become a major industry. In a special study of the Galveston Bay area, over 200 retail bait houses sold over 82,000 quarts of live shrimp, worth over \$164,000 and 50,000 pounds of dead shrimp worth over \$25,000 in a four month period for a total of over \$190,000. The manpower shortage precluded obtaining complete coverage, so these figures are a minimum. Damage by hurricanes to the bait fishing fleet reduced fishing pressure considerably during one of these four months. In this area the catches of the bait fishing vessels have been sampled to obtain the size and species taken.

In the Tortugas area the Service has contracted with the University of Miami Marine Laboratory to determine by sea sampling from a chartered vessel the seasonal distribution of pink shrimp by size, sex, depth and area. Service personnel will also initiate a shrimp marking project from the vessel as soon as the logistic problems of large scale marking with vital stains have been solved.

The Corps of Engineers is presently drawing up sketches and cost estimates for installing a system of running sea water at our Galveston Laboratory to include a number of outdoor salt-water tanks. These semi-controlled conditions will enable us to obtain basic information on shrimp culture that would be very difficult to work out at pilot farms.

Pond Cultivation of Shrimp in South Carolina

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CULTIVATION OF MARINE ORGANISMS in salt water ponds has been practiced in the Orient for five centuries or more. Growing shrimp in such ponds is common practice in many countries, but not in the United States. There are ample tidal marshes along the South Atlantic and Gulf Coasts where shrimp ponds could be built, and the possibility of shrimp cultivation is intriguing. The question is whether or not pond cultivation is economically feasible, and whether or not this method of producing shrimp can compete with trawling.

Detailed cost analyses of production of shrimp by pond cultivation, as against production by a trawler, are not available, but some generalities give an interesting picture. The modern seagoing shrimp trawler costs between \$20,000 and \$40,000. Shrimp ponds can be built for between \$250 and \$600 an acre. The cost of maintaining a shrimp trawler is considerable. Compared to this, the maintenance cost of established salt water ponds is negligible. Cost of operating a shrimp farm is unknown, but considering the operational cost of a shrimp trawler (crew's share, fuel, nets, gear, etc.), certainly a shrimp farmer would not be reduced to penny-pinching. Now the question becomes "Can the acreage of shrimp ponds which can be built for the same cost as a trawler produce annually the 20,000 to 50,000 pounds of shrimp caught by a trawler?"